

**PATENT APPLICATION**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Kevin John WEAVER

Application No.: 10/687,773

Filed: October 20, 2003

Docket No.: 117523

For: VANE WITH MODIFIED BASE

**CLAIM FOR PRIORITY**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

The benefit of the filing date of the following prior foreign application filed in the following foreign country is hereby requested for the above-identified patent application and the priority provided in 35 U.S.C. §119 is hereby claimed:

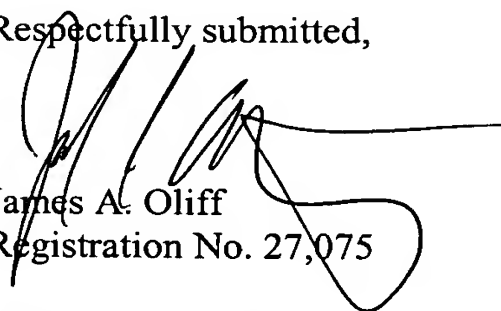
United Kingdom Patent Application No. 0226690.6 Filed November 15, 2002

In support of this claim, a certified copy of said original foreign application:

☒ is filed herewith.

It is requested that the file of this application be marked to indicate that the requirements of 35 U.S.C. §119 have been fulfilled and that the Patent and Trademark Office kindly acknowledge receipt of this document.

Respectfully submitted,

  
James A. Oliff  
Registration No. 27,075

Joel S. Armstrong  
Registration No. 36,430

JAO:JSA/emt

Date: April 2, 2004

**OLIFF & BERRIDGE, PLC**  
**P.O. Box 19928**  
**Alexandria, Virginia 22320**  
**Telephone: (703) 836-6400**

<p><b>DEPOSIT ACCOUNT USE AUTHORIZATION</b> Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461</p>
---





INVESTOR IN PEOPLE

The Patent Office  
Concept House  
Cardiff Road  
Newport  
South Wales  
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

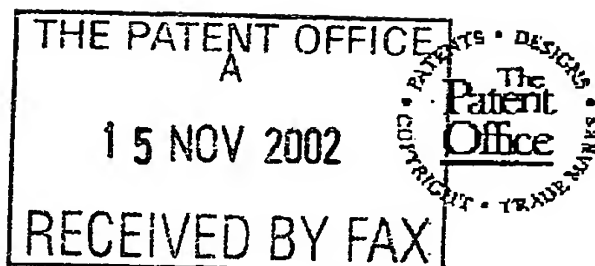
Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Dated 23 October 2003



## Patents Form 7/77

Patents Act 1977  
(Rule 15)Statement of inventorship and of  
right to grant of a patent

The Patent Office

Cardiff Road  
Newport  
South Wales  
NP10 8QQ

15 NOV 2002

1. Your reference PAT/AT/3046

2. Patent application number  
(if you know it)

0226690.6

3. Full name of the or of each applicant ROLLS-ROYCE plc

4. Title of the invention  
VANE WITH MODIFIED BASE5. State how the applicant(s) derived the right  
from the inventor(s) to be granted a patentBY VIRTUE OF THE INVENTORS' TERMS AND CONDITIONS OF  
EMPLOYMENT6. How many, if any, additional Patents Forms  
7/77 are attached to this form?  
(see note (c))

NO

7.

I/We believe that the person(s) named over the page (and on  
any extra copies of this form) is/are the inventor(s) of the invention  
which the above patent application relates to.

Signature

Date

V J BIRD

15 NOVEMBER 2002

8. Name and daytime telephone number of  
person to contact in the United KingdomADAM TINDALL 0117 979 4623  
adam.tindall@rolls-royce.com

## Notes

- a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- b) Write your answers in capital letters using black ink or you may type them.
- c) If there are more than three inventors, please write the names and addresses of the other inventors on the back of another Patents Form 7/77 and attach it to this form.
- d) When an application does not declare any priority, or declares priority from an earlier UK application, you must provide enough copies of this form so that the Patent Office can send one to each inventor who is not an applicant.
- e) Once you have filled in the form you must remember to sign and date it.

Patents Form 7/77

0052798 15-Nov-02 02:53

## Patents Form 7/77

Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

KEVIN JOHN WEAVER  
3 PARSONS GREEN  
CLEVEDON  
NORTH SOMERSET  
BS21 5HR

Patents ADP number (if you know it): 7460926001

Patents ADP number (if you know it):

Patents ADP number (if you know it):

## Reminder

Have you signed the form?

Patents Form 7/77

Patents Form 1/77 THE PATENT OFFICE

Patents Act 1977  
(Rule 16)

15 NOV 2002

RECEIVED BY FAX


 15/11/02 15:46 FAX 01179797337  
 001
**Request for grant of a patent**

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form.)

The Patent Office

 Cardiff Road  
 Newport  
 South Wales  
 NP10 8QQ

1. Your reference PAT/AT/3046

 2. Patent application number  
 (The Patent Office will fill in this part)

0226690.6

15 NOV 2002

3. Full name, address and postcode of the or of each applicant (underline all surnames)

 ROLLS-ROYCE plc  
 65 BUCKINGHAM GATE  
 LONDON  
 SW1E 6AT  
 GREAT BRITAIN

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

GREAT BRITAIN

3970002

4. Title of the invention VANE WITH MODIFIED BASE

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

 MR V J BIRD  
 INTELLECTUAL PROPERTY DEPT WH 58  
 ROLLS-ROYCE plc  
 PO BOX 3  
 FULTON  
 BRISTOL  
 BS34 7QE

Patents ADP number (if you know it)

65789006

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

 Priority application number  
 (if you know it)

 Date of filing  
 (day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

 Date of filing  
 (day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

YES

- a) any applicant named in part 3 is not an inventor, or  
 b) there is an inventor who is not named as an applicant, or  
 c) any named applicant is a corporate body.  
 See note (d)).

Patents Form 1/77

0052798 15 Nov 02 02:53

## Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form 0

Description 5

Claim(s) 2

Abstract 1

Drawing(s) 2

only RM

10. If you are also filing any of the following, state how many against each item.

Priority documents 0

Translations of priority documents 0

Statement of inventorship and right to grant of a patent (Patents Form 7/77) YES

Request for preliminary examination and search (Patents Form 9/77) YES

Request for substantive examination (Patents Form 10/77) NO

Any other documents (please specify) NO

11.

VJB

I/We request the grant of a patent on the basis of this application.

Signature

Date

V J BIRD

15 NOVEMBER 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

ADAM TINDALL 0117 979 4623  
adam.tindall@rolls-royce.com

## Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

## Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered 'Yes' Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- For details of the fee and ways to pay please contact the Patent Office.

Patents Form 1/77



- 1 -

**VANE WITH MODIFIED BASE**

This invention relates to a vane with a modified base. Particularly, although not exclusively, the invention relates to a guide vane having an aerofoil shaped base for use in a gas turbine engine.

Guide vanes are used in the guide vane stage of the compressor of a gas turbine engine. A conventional guide vane stage comprises an outer support ring concentric with an inner support ring, the rings being connected together by a plurality of radially disposed guide vanes. The vanes are provided with bases (or platforms) at each end, which engage in the rings. The guide vane stage directs the flow of air through the compressor.

Conventional vanes have a substantially blade shaped main body integrally formed at its ends with mounting bases which project substantially equidistantly from both sides of the main body. The mounting bases may be machined directly from a blank or may be forged with excess material which has to be machined and hand blended. In certain applications, the radially outer surface of the radially inner mounting base may extend at an acute angle relative to the main body of the vane, so that the outer surface of the mounting base may be difficult to forge or machine in the confined space defined between the radially outer surface of the mounting base and the adjacent portion of the main body of the vane.

According to a first aspect of the present invention, there is provided a vane comprising a main body and a mounting base, at least part of the mounting base being aerofoil shaped.

Preferably, the mounting base projects outwardly beyond a surface of the main body on one side only of the vane.

- 2 -

According to a second aspect of the present invention, there is provided a vane having a main body and a mounting base which projects outwardly beyond a surface of the main body on one side only of the vane.

Preferably, at least part of the mounting base is aerofoil shaped. Most preferably it is formed in an aerofoil shape by forging.

Preferably, the entire side of the main body and mounting base is aerofoil shaped.

Preferably, the surface of the mounting base adjacent the main body forms an obtuse angle with the main body.

Preferably, the mounting base is integrally formed with the main body.

Preferably, the surface of the main body opposite to the side from which the mounting base projects is continuous with a side of the mounting base.

Preferably, the vane comprises a fluid guide vane, such as may be used in a guide vane stage of a compressor.

Preferably, the surface of the main body opposite to the side from which the mounting base projects and an adjacent surface of the mounting base have a substantially continuous profile.

Preferably, mounting bases are formed at both ends of the vane.

Preferably, each mounting base projects outwardly beyond a surface of the main body on one side only of the vane.

For a better understanding of the present invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

- 3 -

Figure 1 is a perspective view of a conventional guide vane;

Figure 2 is a cross-section through the guide vane of Figure 1;

Figure 3 is a perspective view of a guide vane having an offset mounting base at its lower end;

Figure 4 is a cross-section through the guide vane of Figure 3;

Figure 5 is a perspective view of the guide vane of Figure 3 taken along a centreline of the guide vane; and

Figure 6 is an enlarged perspective view of the inner end of the guide vane of Figure 3.

Figures 1 and 2 show a conventional guide vane 1 comprising a main body 2 which is integrally formed with an inner mounting base (or vane platform) 4 at its radially inner end 5, and an outer mounting base (or vane platform) 6 at its radially outer end 7. The inner mounting base 4 and outer mounting base 6 are provided with formations (8, 10) which engage with cooperating formations formed on a radially inner guide ring and a radially outer guide ring of a guide vane stage of a compressor (not shown).

The main body 2 of the guide vane 1 is generally blade shaped, comprising first and second aerofoil surfaces 12, 14 extending between first and second edges 16, 18. The first aerofoil surface 12 is substantially convex in a circumferential direction and concave in a radial direction, whereas the second aerofoil surface 14 is substantially concave in a circumferential direction and convex in a radial direction. Also, the body portion 2 has a slight aerofoil twist to enable machine tool access to a radially outer surface 20 of the inner mounting base 4 in the region R indicated by a circle in Figure 2. This aerofoil twist is necessary because the outer surface 20 of the inner mounting base 4 forms an acute angle with the second aerofoil surface 14 of the main body 2, which results in restricted access to the outer surface 20 of the inner mounting base 4.

- 4 -

As best shown in Figure 2, the inner mounting base 4 projects beyond the first aerofoil surface 12 and the second aerofoil surface 14 of the main body 2. Similarly, the outer mounting base 6 projects beyond the first aerofoil surface 12 and the second aerofoil surface 14 of the main body 2. Consequently, once the main body 2 has been forged, together with the inner mounting base 4 and outer mounting base 6, it is necessary to machine both mounting bases 4, 6 on both sides of the main body portion 2. This process is time consuming and expensive, particularly because machining has to be carried out in the region R mentioned above, in which machine tool access is restricted.

Figures 3 to 6 show a guide vane which is substantially identical to the guide vane illustrated in Figures 1 and 2, apart from the shape of the inner mounting base 4. In this embodiment, like parts are given the same reference numbers as in the prior art arrangement described above.

In the embodiment of Figures 3 to 6, the second aerofoil surface 14 is continuous with a side 22 of the inner mounting base 4, so that the inner mounting base 4 only projects beyond the first aerofoil surface 12. Consequently, the machining problem identified above in relation to the prior art arrangement is completely removed. Indeed, machining may not be required at all to form the inner mounting base in the region R adjacent the second aerofoil surface 14. Furthermore, the entire second aerofoil surface 14 and adjoining side 22 of the inner mounting base 4 can be made aerofoil shaped simply in a forging operation, so that no machining (or at least only minimal machining or hand blending) is required to form a finished surface. Also the air flow over the finished vane 1 is smoother than in the prior art arrangement, particularly in the transition region between the main body 2 and the adjoining surface of the inner mounting base 4.

Although in the illustrated embodiment, only the inner mounting base 4 is modified, it will be appreciated that the outer mounting base 6 could be modified instead, or in addition.

- 5 -

It will also be appreciated that the invention has particular efficacy in the manufacture of vanes made by casting methods.

It will also be appreciated that the invention has particular efficacy in the manufacture of vanes made from non-metallic or composite materials.

- 6 -

**CLAIMS**

1. A vane comprising a main body and a mounting base, at least part of the mounting base being aerofoil shaped.
2. A vane as claimed in claim 1, in which the mounting base projects outwardly beyond a surface of the main body on one side only of the vane.
3. A vane having a main body and a mounting base which projects outwardly beyond a surface of the main body on one side only of the vane.
4. A vane as claimed in claim 3, in which at least part of the mounting base is aerofoil shaped.
5. A vane as claimed in claim 1, 2 or 4, in which the aerofoil shape is formed by forging.
6. A vane as claimed in any one of the preceding claims, in which the entire side of the main body and mounting base is aerofoil shaped.
7. A vane as claimed in any one of the preceding claims, in which the surface of the mounting base adjacent the main body forms an obtuse angle with the main body.
8. A vane as claimed in any one of the preceding claims, in which the mounting base is integrally formed with the main body.
9. A vane as claimed in any one of claims 2 to 8, in which the surface of the main body opposite to the side from which the mounting base projects is continuous with a side of the mounting base.

- 7 -

10. A vane as claimed in any one of claims 3 to 9, in which the surface of the main body opposite to the side from which the mounting base projects and an adjacent surface of the mounting base have a substantially continuous profile.
11. A vane substantially as described herein, with reference to and as shown in Figures 3 to 6 of the accompanying drawings.

- 8 -

**ABSTRACT****VANE WITH MODIFIED BASE**

A guide vane 1, such as may be used in a guide vane stage of a compressor (not shown), the guide vane comprising a main body 2 and a mounting base 4. In one aspect of the invention, at least part 22 of the mounting base 4 is aerofoil shaped.

In another aspect of the invention, the mounting base 4 projects outwardly beyond a surface 14 of the main body 2 on one side only of the guide vane 1.



1/2

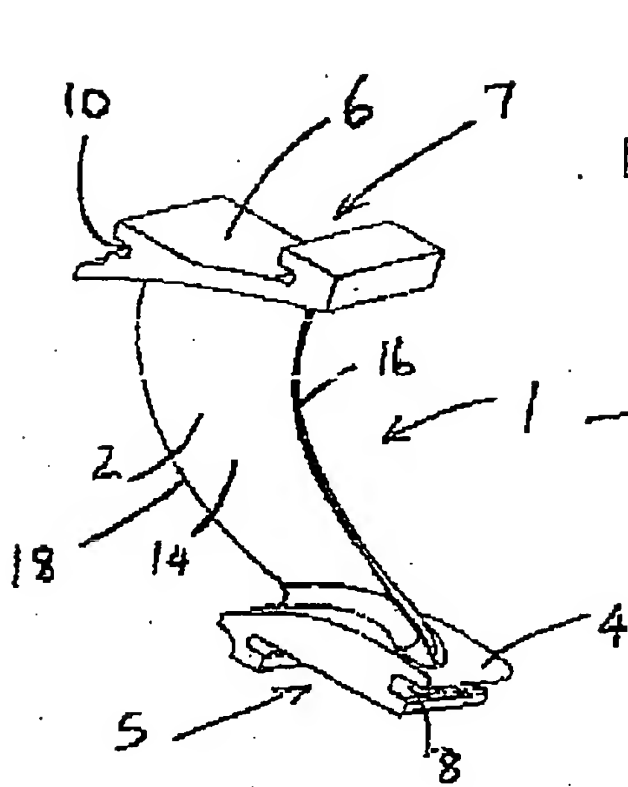


FIGURE 1 - PRIOR ART

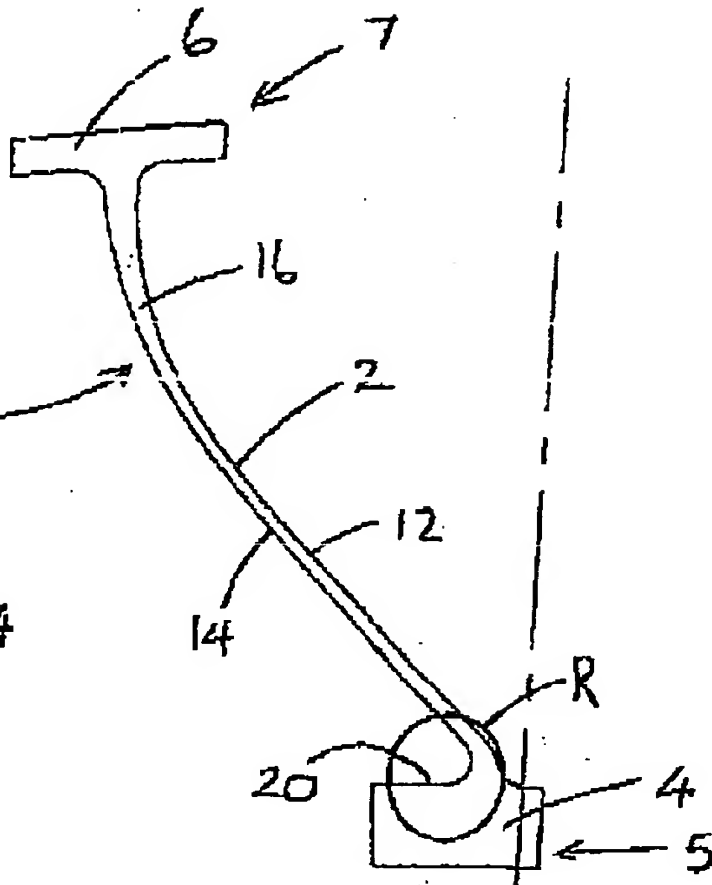


FIGURE 2 - PRIOR ART

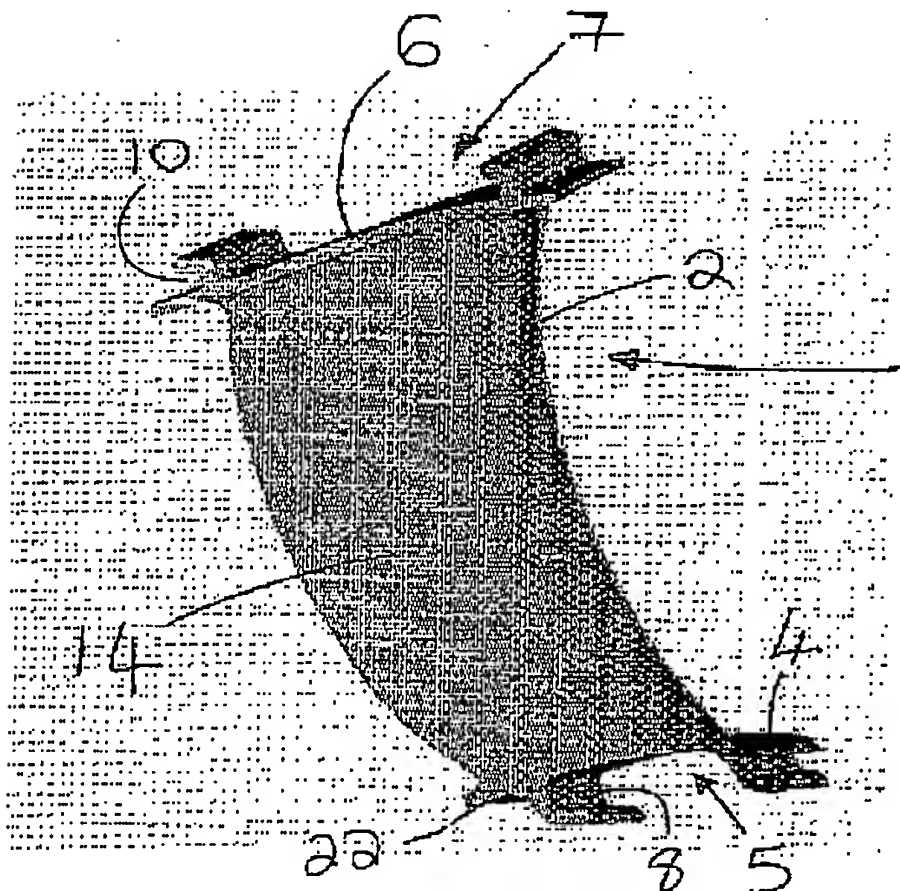


FIGURE 3

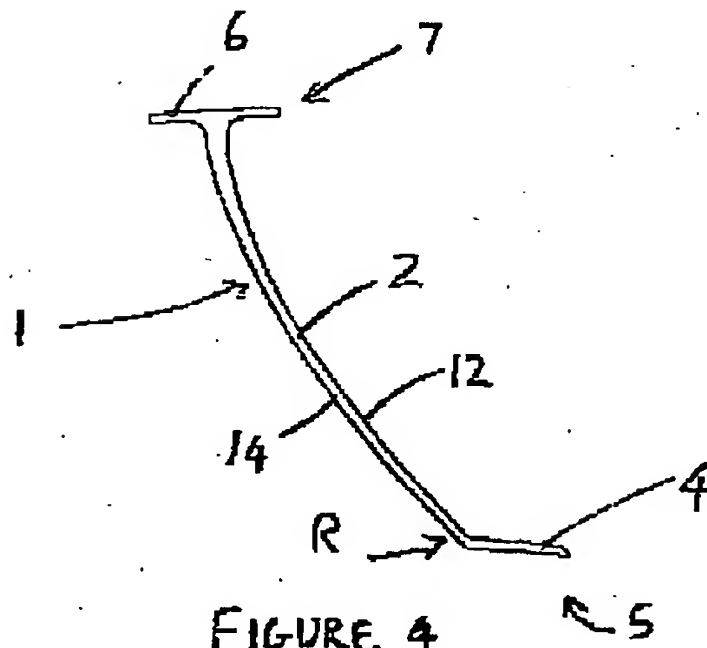
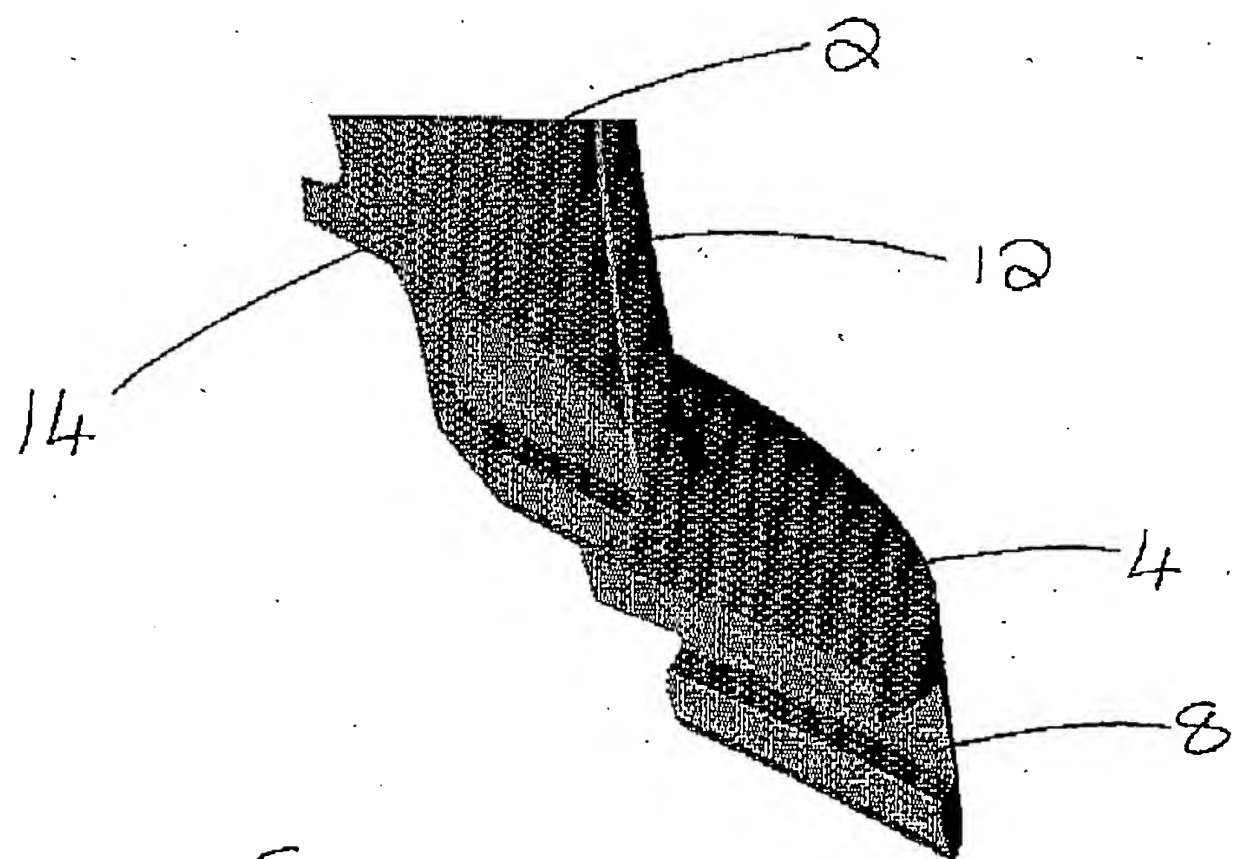
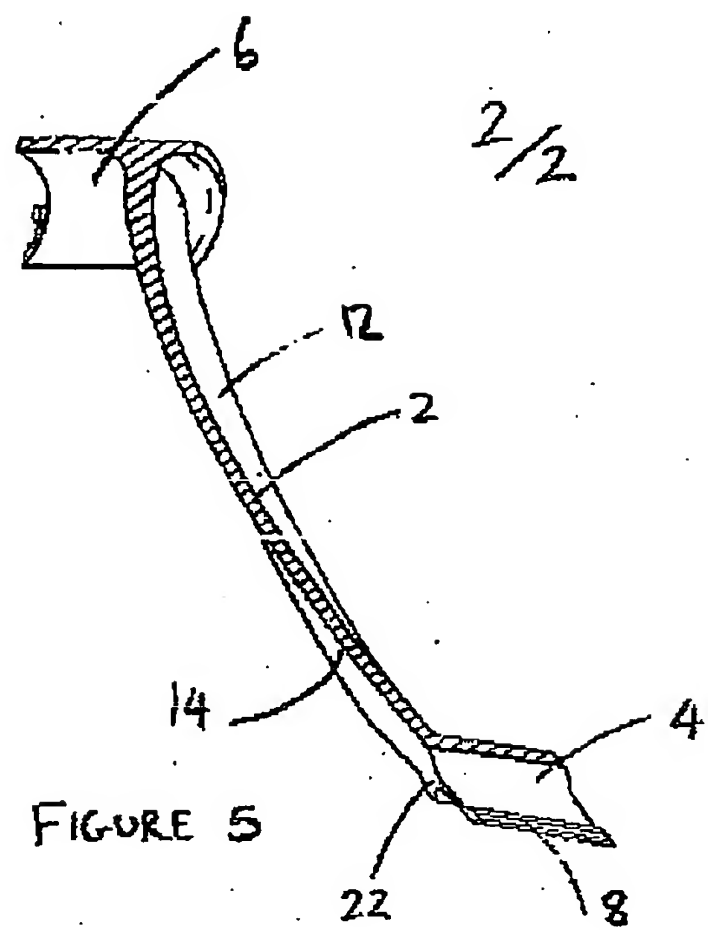


FIGURE 4





**THIS PAGE BLANK (USPTO)**

**BEST AVAILABLE COPY**